SCIENCE.

FRIDAY, JULY 24, 1885.

COMMENT AND CRITICISM.

AMONG THE COLLEGE ASSEMBLIES of this season of the year, the most unique is that of the Convocation of the University of the state of New York. The organization of that body is so peculiar as to be hardly understood in other states, and a word in respect to it may interest our readers. The regents of the university are charged by the state with certain functions which pertain to the control of the academies and high schools of the state, and with a mild oversight of the universities and colleges. Once a year the regents invite the heads of all these institutions, and representatives of the faculties, to assemble in the senate chamber in Albany, and discuss such subjects as may be of special importance to the educational concerns of the state. This is known as the Convocation. Formal papers are read, addresses are made, and deceased teachers are commemorated; but probably the most useful feature of the gathering is the discussion of selected topics by appointed speakers, in the presence of a company of specially interested auditors. For example: at the convocation on the 9th of July, the chancellor of the university left the chair, which was taken by the president of Hamilton university, who introduced the topic of the day, — college discipline. The theme which he opened was discussed by the heads of several other leading institutions in the state. The contrast between such an educational conference and the great conventions of teachers is very marked. The talking is not for the outside public, though anybody may be present who wishes, and the reports in the newspapers are very brief; but the parties interested learn to know one another. They compare their views as experts, and give and take suggestions as to the theory and practice of the work with which they are charged. No mercantile element is allowed; or, in less euphonious phrase, no book-agents are allowed any privileges in these assemblies.

OUR READERS ARE WELL AWARE that early in June the memorial statue of Charles Darwin, by Boehm, toward the erection of which popular contributions were received from many lands, was unveiled in its permanent site in the great hall of the new natural-history museum of South Kensington. An appropriate address was delivered on that occasion by Professor Huxley, president of the Royal society. We refer to the subject again for the sake of calling attention to one incidental but not unimportant feature in the ceremony, — the presence of men from almost all parties and shades of religious opinion among English protestants. The appearance of the Prince of Wales, the Archbishop of Canterbury, the Dean of Westminster, Mr. Beresford Hope, Archdeacon Farrar, not to name any others, is enough to show that the 'establishment' is not unwilling to honor the great naturalist of our age. When the obloquy encountered a few years ago by 'Darwinism' — obloquy not yet entirely dormant in some portions of the United States — is borne in mind, the list of those who assembled on this occasion is as gratifying as the statement that contributions to the memorial were received from fifteen countries, besides the three kingdoms and the British colonies.

AN UNFORTUNATE CONTROVERSY has arisen in the ranks of the medical profession of this country with respect to the meeting of the ninth International medical congress. It is a controversy, however, in which all scientific men among us are interested. Indeed, the good name of American hospitality is involved in its settlement. The International congress, which meets triennially, had determined to meet in Washington in 1887. It is an asso-

ciation of the highest character and dignity, the meetings of which, for many years past, have been attended by the ablest men of the profession. Great benefits, as well as great pleasure, were anticipated from their assembling in this country. The American medical association, having a national name and a national constituency, appointed a select and judicious committee of arrangements; and this committee, having made good progress in their plans, and having secured the promises of co-operation from a large number of the profession, reported what they had done to the American medical association at its recent meeting in New Orleans. The report was received with unexpected disapprobation, in which it is not too much to say that personal and geographical jealousies were apparent. Another committee was appointed, which subsequently met at Chicago, and 'upset' nearly all that had been done so carefully by the first committee. Now, it appears that the first committee, though its work was 'upset,' commands, in fact, much more confidence from the profession than the second. The gentlemen invited by the new committee to co-operate have begun forthwith to make excuse. In Washington, Baltimore, Boston, and Philadelphia, — and perhaps in other places from which we have not heard, — men of the highest professional standing and personal character decline to act with the revolutionary party. Their cards have been made public, and have begun to attract attention from the daily press.

It now looks as if the revolters would not command the situation. Certainly men of eminence abroad will be slow to accept an invitation to an international congress upon this side of the Atlantic, if a large number of the most eminent physicians snd surgeons of this country, widely known professionally as well as personally, have been treated with discourtesy in the preliminary arrangements, and are therefore compelled to stand aloof. It does not look as if the new committee could enlist the general co-operation essential to success, and particularly because their authority is exercised in what appears to be the spirit of hostile reflection upon measures already initiated, against which no good objection has been made. The only solution of the problem seems to be, for the second committee to acknowledge their inability to form a government, and stand aside, allowing the original committee to go forward and perfect their plans, either in the name of the American medical association or in the name of the profession at large, by some concerted action, which there is time enough to mature. The latter alternative seems to us most likely to be successful.

During the past decade, Professor Elias Loomis of Yale college has read a series of twenty-one papers, entitled 'Contributions to meteorology,' before the National academy of sciences. The material for these studies has been drawn largely from the publications of the signal-service, and especially from the daily weather-maps, which now present so great an accumulation of observations that extremely accurate conclusions can be drawn from them. The results thus gained, as published in the *American journal of science*, constitute the chief source of generalized knowledge that a student can now consult concerning the behavior of cyclonic storms in this country, on which daily weather-changes depend so largely. The work has been throughout characterized by careful and discriminating methods, and forms as excellent an example of inductive research as can be placed before a student for a model. When put together, the 'contributions' now make a considerable volume, and form a fitting sequel to the early papers on the same subjects, written by Professor Loomis nearly half a century ago.

In the recent report of the Yale-college observatory, Dr. Waldo complains, and apparently with great justice, that the legislature of Connecticut, at its last session, suddenly terminated its contract with the observatory 'for time-service' to the state at large. He says that this action was taken without a hearing

from the railroad commissioners, the manufacturers of clocks and watches, the mayors or other authorities in the cities of the state, the telephone and telegraph companies, or the observatory. He states that no reason for this action was given except economy; and he claims that the observatory should be at least reimbursed for the considerable expense which it had incurred in preparation for this service. Unless there is some reason for the action of the general assembly not apparent to us, its conduct is certainly most discreditable to a state so intelligent and so wealthy as Connecticut. Nobody can believe that the moderate charge upon the treasury, in return for a service of such universal advantage, can have been burdensome. It is more likely that the action was due to a lack of acquaintance with the points involved, or to the prejudice of some individual. It is remarkable that a state which may almost be called 'the land of the clock-maker' should by its official action throw contempt upon accurate time-keeping. Such 'jerky' legislation is what the state universities of the west are wonted to, but nobody expected it in a matter like this from the land of steady habits. The first of steady habits is fidelity to an engagement, real or implied; and the second is like unto it, — punctuality in all matters where time is an element in the obligation.

LETTERS TO THE EDITOR.

**** *Correspondents are requested to be as brief as possible. The writer's name is in all cases required as proof of good faith.*

Untimely death of a chipping-sparrow.

THE following tragic event occurred in the village of Wake Forest on the 15th of June. The nest was near completion: the lining of hair was being put in. Somehow, in the midst of this process, the sparrow's head became entangled in one end of a long horse-hair, the other end of which had been securely woven into the bottom of the nest. When he rose to go, the half-knot tightened round his neck, and poor chippy was found dangling some twelve inches below the nest, hung by the neck, and quite dead. I am told that a similar event occurred here a day or two after that stated above. In this case, however, the sparrow was hung by a cotton string, and was found so soon after the mishap, that he was released, having suffered little harm.

W. L. POTEAT.

Wake Forest college, North Carolina.

The Washington monument, and the lightning stroke of June 5.

By one who was near its base, the stroke of lightning which injured the Washington monument is remembered as a ball of fire coming towards him. Does not this observation explain the ball of fire so often reported? An electric spark passing between two points, will, to a circle of observers, present various appearances. If two inches long, it will be seen as a line of fire two inches long by some, while to those in the line of its motion it will be a single spark. So when a flash of lightning (a line of fire) is directed toward the observer, it must appear as a ball of fire, motionless if the movement is directly toward the observer, moving with comparative slowness if slightly off that direction, and with electric rapidity if across the field of view at right angles with the line to the observer's place.

M. C. MEIGS.

Washington, D.C.

Volcanic dust east of the Rocky Mountains.

My attention has recently been called to the interesting letter of Mr. George P. Merrill in *Science* for April 24, on 'Volcanic dust from south-western Nebraska,' and his subsequent paper on the same in the Proceedings of the U. S. national museum, 1885, pp. 99, 100. Since Mr. Merrill seems not to be aware of any earlier published notice of similar volcanic dust found east of the Rocky-Mountain region, a short note may not be amiss here.

In October, 1882, my friend and colleague, Mr. Samuel Garman, placed in my hands for examination a fine gray sand found in Dakota. This, on examination, was seen to be composed of volcanic glass in shards, tubes, etc., mostly water-clear; but a few forms contained glass inclusions and vapor cavities. A few grains were brown, like many of the rhyolitic glasses; many were ribbed, or thicker on one side, thinning down to an edge on the other; others were apparently of uniform thickness; and none gave evidence of being wind or water worn. A very little earthy material was found mixed with the volcanic ash. Mr. Garman gave an account of this deposit of glass before the Boston scientific society, Nov. 8, 1882, and a notice of it was published in the *Boston transcript* for Nov. 10. Attention was further called to this glass in my 'Lithological studies,' published early in November last, on p. 17. Mr. Garman has given me the following information regarding the deposit: —

"It was found about fifty miles south by east from the Black Hills, between the Niobrara and the White rivers, just north of the watershed, not far from the head of Antelope Creek. The bed is horizontal, and, as I remember it, nearly two feet in thickness at its thickest portion, and several rods in extent. The deposits in the immediate neighborhood are late tertiary. A small stream had cut away the bank in which the glass lay, exposing a considerable portion of it. From the exposed edge the powdery material is carried away by the wind as a fine, smoke-like dust. The glass in the bed is as clean as in the sample, except near the upper and lower surfaces, where it is mixed with other matter. To be so clean, it must have been deposited by water almost free from other impurities, for the winds would have mingled other dust with it."

M. E. WADSWORTH.

Museum of comparative zoölogy,
Cambridge, Mass., July 9.

HUMANISM IN THE STUDY OF NATURE.

In a liberal education we must hereafter recognize a twofold division of our labor. On the one hand will be placed those studies which serve the purpose of humanizing the youth, i.e., of bringing him into a state of sympathy with his fellow-mortals; and, on the other, the studies which will serve to give the required measure of knowledge concerning the unhuman world,—the realm of physical and organic nature. The great profit of the present discussions concerning education has been found in the fact that it has brought this dual character of the work of education clearly into view.

What, however, has this lower world of facts to give, that can be of such value that the student is told to turn from the field of man for its study?

We will pass quickly by the commonest argument. Unhuman nature, say many, concerns us because we have to live in it: it is a great engine, whose power may grind our grists, or whose merciless wheels may crush out our lives. Master its movements, that you may have power at your command; keep your frail self from its dangers, that you may live long. This is the way that some look upon the outer world. It is a sensible view, but in itself it little concerns the problem of education. From this point of view, nature is for the economist, for the practical man.

But for the purposes of a general education, the realm of nature beyond human interests should be approached with the view, first, to get some sound general idea of the construction of this realm, and its relations to the life of man in the largest sense of that life; next, to secure some clear sense of the nature of scientific evidence; and, lastly, to gain an idea of the order and control which exists in the extra-human world.

Purely human education is deficient in perspectives: it finds man as man; it considers his relations to his fellows, and leaves him separated from the universe, alone amid a world of physical and organic life. But to secure a sound understanding of man's place in nature, we must give the student some general ideas as to the ways of that nature.

This end should be secured by studies which begin with the human body and its functions, and afterwards extend progressively farther and farther away. We have thus the help of the human interest which surrounds our own personal affairs, and extends, through immediate sympathy, to the lower world of living things. The elements of human anatomy and physiology should be the first thread to guide the student to the world beyond man. This may profitably lead to the study, in outline, of organic life below man, — a study which should aim at a clear understanding of a few lower animals and a limited number of plants. After the student has some accurate knowledge of the bodily parts and functions of a cat, a bird, a frog, and a fish, his mind is prepared to receive a little general truth given in words concerning the vertebrated animals. In the same way, an insect, a lobster, and a worm will give the basis for understanding the articulate animals; a snail, a clam, and a squid will show him his way to an understanding of the molluscan affinities; and so on. In the plants, a seaweed, a fungus, a fern, and an ordinary flowering plant, will, if well known, serve to make real a great many important general facts which have to be presented in a didactic fashion. In this teaching, constant effort should be made to give the matter a human interest by referring to man's body and habits, or his physical relation to the lower world, for comparison or illustration.

The next step will necessarily take the student into the realm of geology, or earth-history. Here the world of our day should be shown with especial reference to its relations to human life and its development. It is easy so to knit the considerations of the existing conditions of the earth with the interests of man. Over the bridge of human sympathies we may easily find a way for the student into the wider realm of the world-life. Climate may be studied with reference to human history, or the geographical distribution of organic beings, including man; volcanoes and earthquakes, with reference to their effects on the life of our species: so nearly every department of the earth's history may be made to have a relation to the natural human interests which the child brings with it to the study of the outer world. I know that there are those who will object to the anthropocentric, the over-humanized view of nature which this form of teaching tends to inculcate; but to the mass of men this is a necessary way of looking at the world. The worst failures in teaching science have come from a neglect of the all-important fact that nature is to most minds only interesting because of its relations to man. It may be — but may a merciful Providence defend us from the evil — that in time many children will be born to whom crystals are as interesting as human lives, and a geological period as full of

charm as the best age of Greece. To the specialist the remotest problems of science, doubtless, come to have living interest, become a part of his life, in fact; but they are not so to the beginner.

After some sense of the present conditions of the earth's surface is gained, the youth may be shown the evidences of the earth's past. It is particularly desirable that this inquiry into the old conditions of the earth should be so made as to aid the student to conceive the antiquity of the earth's past. This conception of past time is the most difficult to form of any of the large understandings of nature, while at the same time it is the most enlarging idea that can be obtained from geology. It gives much that will re-act on the youth's understanding of human history. If on viewing the slow gain of man in his progress from age to age, the persistence of evil beneath the guise of changed manners, and the inevitable sinking into the pit which seems in time to overtake all peoples, there comes to the student that sense of helplessness which so often assails the most ardent believers in the future of humanity, the geologic past has consolation for him. There he sees that 'one eternal purpose runs' through all those ages, and that the very catastrophes which seem to bring temporary ruin are but the steps to new life. Even more valuable than this is the impression of amplitude of time, which the student needs to secure as the basis on which to rest all his understandings of nature. Measuring the progress of all events from the infinitesimally brief duration of human life, the student is prone to impatience with the slowness with which this march of the ages goes on. Give him a sense of the larger space of the earth's history, and we relieve the mind of this prejudice.

Beyond the realm of the earth, it is not worth while to try to do much. Astronomy has, however, some tolerably simple and most important lessons. Its greater truths are unfortunately only accessible through the way of rather difficult mathematics; but there are some conceptions which are to be obtained with little labor, and which should be won. The order of the solar system, and the relations of the several planetary bodies, should be within the compass of minds entirely unskilled in mathematics. The first of these relations to be studied should be that which is found in the revolution of the earth around the sun, and the concomitant effects derived from the increase and diminution of eccentricity of its orbit, the precession of the equinoxes, and the rotation of the apsides. With a small globe (or, as well, an orange), with pins to represent the poles, and a thread for the equator, a lamp on a centre-table to represent the sun, and a little exercise of limbs and wits in conveying the sphere around the table in a way to imitate the phenomena in question, the student can gain a clear conception of a most important series of relations. The student should then proceed to the work of extending the same order of conceptions to the other bodies of the solar system.

As in geology the student finds a profit in the expansion which the conception of vast duration forces upon the mind, so in the study of astronomy enlargement may be gained by the conceptions of space which are brought home to him in the study of that science. Neither geologic time nor celestial space can really be conceived by the mind; still, the effort to grapple with such immensities, though seemingly futile, is yet profitable. Especially if it be often repeated, this effort bears fruit in a sense of power which is given by no other mental exercise. Many things may give breadth to the mind, but among these widening agents the conceptions of time and space deserve high rank. It would be in a certain way true to say that we might get a measure of the greatness of a mind by its power to conceive a wide field of temporal and spacial relations. May we say that these measures enter the soul, and give it something of their dimensions?

We turn now to the use which we may make of nature when we seek to give the mind a conception of the relations of cause and effect, and the nature of evidence. The best field for such study is to be found in the department of physics and chemistry. There we may in many cases so isolate the phenomena we are examining, that they are uninfluenced by other conditions than those which can be perceived and taken into account. Studies in this field should begin with the phenomena of masses, with the effects of gravity, of momentum, and other actions where the facts are in the realm of tolerably familiar experience. Such personal experiences should be multiplied until the mind becomes habituated to the actions which it is contemplating. From this firm ground, studies should be extended to the obscurer phenomena of physics, or such as are found in those parts of the subject where the causes are invisible, as in the great field of electrical action. There the mind can become accustomed to the consideration of causes which are not only invisible, but outside of the limits of ordinary experience.

After some training in this department, the

student should next make acquaintance with chemical action. Here the aim should be to show the complication of laws which control the relations of bodies, molecules, and atoms, which entirely elude the senses. Nowhere else can the student so well attain to a conception of the penetrating influence of natural law or the infinite variety of its results. No other department of study will do so much to take away the idea of grossness, of inorganization, which the untrained mind applies to the world of matter. It is not necessary that the student should make much progress in analytic chemistry: the simpler the phenomena chosen for the study, as long as they involve the perception of quantitative relations, the better for this task. The main point to be attained is the comprehension of the principles of atomic and molecular relations, and an understanding of the nature of evidence as to causation, which this science, as well as physics, so well affords. Although the field to be gone over in these departments is not wide, it should be patiently and repeatedly traversed, in order that the mental effect should be clearly and firmly borne in upon the student.

We now come to the third end which we should seek to attain in our use of natural science in the work of education. This is the conception of the order and continuity which prevails in nature. In the lower states of human culture, we find the savage and half-civilized peoples looking upon the physical world as a domain which is under the control of superhuman yet essentially human persons. All the order and much of the apparent disorder of the outer world are accounted for by the control and the contentions of these superhuman powers. The advance towards monotheism gradually did away with this crude but natural conception of law; and in its place has come a dull, inert sense of the mere power of the physical universe, which has no educative value whatever, and which is in truth falser to the facts than the conception of nature held by the orthodox Greek of the Periclean age. In place of the old animism which humanized all parts of the universe by giving its control to powers which were akin in nature to, and in sympathy with, man, we have now a set of meaningless terms which cloak our want of understanding.

The first aim of education should be, if possible, to restore the old sense of close sympathetic relation to the outer world which was lost with the death of polytheism. To restore it on the line of our new and higher knowledge of the universe, man must in some way find himself in the world of physical life. Our monotheistic religion cannot do this work, for it turns the mind towards the infinite alone: it almost necessarily neglects the phenomenal world. Even the theory of design failed to lead men to the study of nature. Religion, in the proper sense of the word, concerns the moral side of man too completely to aid us in this task: if man is to gain a better reconciliation with the physical world, he must secure it on other lines.

The only possible way in which a real sense of kinship with the outer world can be aroused is through the sympathies, first by the sense of beauty in nature, next through the kindred sense of order or continuity of action in the physical world.

There is an instinctive progress towards this reconciliation which is brought about by the growing love of the beautiful in nature. It is hard to prescribe a way in which it can be fostered: it is not easy to do this work in the case of any sympathies; but the teacher will readily see that it is the most precious of all the means by which man can find his way to a more loving relation with the outer world. When the teacher of natural science can create or deepen the sense of the beautiful and the ordered in nature, he has done his work as minister in this great need.

In close relation to this sense of beauty is the sense of order in physical and organic nature. The teacher should endeavor in all ways to give the pupil a sense of the absolute continuity of action in the world. This difficult conception is perhaps best obtained by presenting the evidence that man is, at least in his body, the product of a continuous life, which, from the earliest ages to the present day, has gone step by step upward. Let the student grasp what he can of this overwhelming truth; let him see how, through all the accidents of this perturbed world, the life which has led to himself — his life, in fact — has gone unfalteringly forward to its end. We thus give him a feeling of his kinship with nature, — a sense of a kindly filial relation to the earth which will widen and deepen all the ways of thought.

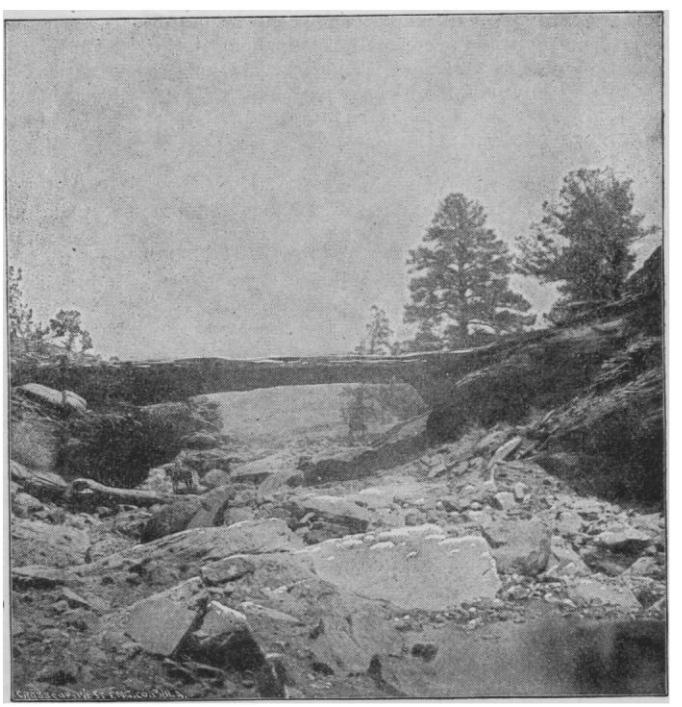
Thus, without going very far beyond the theory of a thoroughly humanized education, without demanding more than one-third the schooling-time between the ages of ten and twenty, it will be possible to give the youth all the training which is necessary to secure the best that scientific culture can afford.

N. S. SHALER.

AN ARIZONA NATURAL BRIDGE.

DURING a visit to Arizona, I came across a natural bridge, an account of which may be of interest in connection with recent notes on the Virginia bridge.

A long ridge, about six hundred or eight hundred feet high, extends for some distance north from a point near which the Atlantic and Pacific railroad crosses the boundary between New Mexico and Arizona. This ridge is formed by strata of dark-red sandstone under light-red, and is capped by a stratum of fine conglomerate or coarse grit. These strata are broken, and present an abrupt and generally perpendicular face to the west, sloping at an angle of 14° to the east, with the course of the stream, until they bury themselves below the alluvial sand. There are lower ridges, of corresponding structure, parallel to this on the east and west. This ridge is cut by deep and narrow cañons. At the mouth of one of these cañons, just before it dips under the sand, occurs this bridge. It is about twenty miles from the railroad, and, as far as I know, has never been visited by white men. I was guided to it by my Indian scout. The cañon extends west for about five miles above the bridge, and becomes deep, narrow, and wild; the sides, with their growth of hard-wood and pine, almost cutting off the light at mid-day.



The bridge is formed by a remnant of the overlying grit, which is continuous with it on both sides. The section cut through beneath it is of light and dark red sandstone, the former showing very pretty cross-bedding, and is non-conformable to the latter, which has much less dip. The bridge is sixty-five feet long, and fifteen feet wide at the narrowest point. It is two feet thick in the centre, and fifteen feet at the sides. The illustration, from a photograph taken at the time, will give a good idea of the position and proportions of the bridge; our ponies, standing underneath, serving for comparative measure. It will be seen that the cañon is wider for a short distance above the bridge, which may be due to a tributary cañon at that point.

It is difficult to give an explanation of this curious phenomenon; and I shall only suggest a possibility, in the hope that some one will find time to investigate it more thoroughly. If above the present grit there had been soft strata, capped again by grit, it might be explained on the principle of the Swiss pot-holes; a waterfall being formed above, which wore a hole through the lower grit, and so undermined it, and cut out the sandstone beneath, as at Trumelbach. But the grit has every appearance of being a continuous cap over the ridge. The grit shows, however, evidence of an inclination to break into blocks; and it may be that a large crack, thus formed to the west of the present bridge, allowed the stream to reach the soft sandstone, and so cut it away beneath.

A short distance off is another curious but not so uncommon phenomenon, — a 'petrified forest.' The stone tree-trunks lie just beneath the soil, or half exposed, fallen in all directions. I procured specimens which showed the bark, knots, roots, and branches. The radiate arrangement of the wood-cells was very evident in some cases. There are a number of these 'petrified forests' in Arizona, I was told. I know only of one other on the Navajo reservation, and one near Flagstaff.

FREDERICK GARDINER, Jun.

THE RECENT AGRICULTURAL CONVENTION AT WASHINGTON.

PURSUANT to a call issued by the commissioner of agriculture in May last, a convention of agricultural colleges and experiment-stations was held in Washington on July 8 and 9. The meeting was well attended, some thirty states and territories being represented by nearly fifty delegates; and the deliberations of the convention were marked by a noteworthy spirit of harmony and earnestness.

An informal gathering of the delegates in the parlors of the Ebbitt House on the evening of July 7 served to increase their acquaintance with each other and the commissioner of agriculture, and to outline a plan of organization for the convention.

The meetings of the convention were held at the Department of agriculture. At its first meeting, on Wednesday morning, it was organized by the choice of Hon. Norman J. Colman, commissioner of agriculture, as president; Presidents Willets of Michigan, Lee of Mississippi, Atherton of Pennsylvania, and Fairchild of Kansas, and Professor Dwinelle of California, as vice-presidents; and President Fairchild of Kansas as secretary.

The opening address of the commissioner occupied nearly an hour, opening with a review of the history of the land-grant colleges, but mainly occupied with suggestions as to how these colleges may attain to greater usefulness and success. The speaker regarded agricultural experimentation as being at present one of the most important and profitable functions of agricultural colleges; and the two thoughts most prominent in the address, as well as in the subsequent proceedings of the convention, were the need of a more generous financial support for this work, and the desirability of establishing more intimate relations between the U. S. department of agriculture and the several state institutions devoted to the furtherance of scientific agriculture.

The first business of general interest brought before the convention was a resolution introduced by the committee on order of business, approving the principle and general provisions of the bill to establish experiment-stations in connection with the agricultural colleges, introduced into the last congress, and known as the Cullen bill. The resolution was supported by Col. Switzler of Missouri in an eloquent speech, and also by Professor Knapp of Iowa, President Smith of Maryland, and Professor Cook of New Jersey, and was adopted by an almost unanimous yea and nay vote, only three or four delegates being absent, and no one voting nay. Following this, a committee of three on legislation, consisting of Presidents Atherton of Pennsylvania, Willets of Michigan, and Lee of Mississippi, was appointed to act in conjunction with the commissioner of agriculture in endeavoring to secure from the next congress legislation on this subject. Subsequently a general committee of one from each state was appointed, one of the duties of which was to endeavor to bring public opinion to bear upon this question, and to secure the votes of their respective states for the measure.

Upon the important subject of the relations which should subsist between the department of agriculture and the agricultural colleges and experiment-stations of the country, the convention expressed itself with a commendable degree of moderation. It is sufficiently obvious, to any one who is practically acquainted with conditions of experimental work, that the dreams of certain enthusiasts who would like to see this work organized with almost military rigor, under the direction of a central authority at Washington or elsewhere, can never be realized until human nature undergoes a radical change. Men who are competent to plan and carry out original investigations will not consent to lose their individuality, and become parts of a machine, however well constructed. The convention wisely recognized this fact, and confined its recommendations to the establishment of a 'bureau of correspondence and exchange' in the department, to serve as a means of communication for the several colleges and stations with each other and the department. It is intended that this bureau shall act as an agent in the exchange of reports of experiments, and also that it shall publish at regular intervals a summary, couched in popular language, of the results of investigations in this country, and possibly also in foreign countries. To aid in accomplishing the latter purpose, those present agreed to furnish the commissioner of agriculture, when called upon, with the results of experiments conducted at the institutions represented by them.

Commissioner Colman entered heartily into the plan, and agreed to carry it into execution as fully as the funds at his disposal would permit; and it is due to him to say, that, in all the proceedings, he showed a hearty desire to co-operate with the convention in carrying into effect any plan deemed wise by it, and exhibited not the least spirit of dictation or desire for the undue aggrandizement of his department.

Very plain language was used by several speakers to characterize the present methods of seed-distribution; but nearly all agreed in recognizing it as, for the present, a necessary evil. The commissioner announced, however, that he hoped to secure a special appropriation from congress for the purchase and distribution of seeds and plants from foreign countries, and that, if he were successful, he desired the co-operation of the agricultural colleges and stations in testing them in different regions of the country. This proposition met with the hearty and formal approval of the convention.

In addition to these matters, various subjects of minor importance were considered; and a very interesting discussion was had upon industrial education, opened by a paper by President Willets.

While the final success of the convention will be judged by its results, as a meeting it was eminently satisfactory; so much so, that it was unanimously voted to continue the organization by the appointment of a general committee of one from each state, as already noted. From this general committee, an executive committee of six was chosen to arrange for another convention at the proper time.

SIR PETER LUMSDEN ON THE TRIBES UPON THE AFGHAN BOUNDARY.

IN speaking before the Royal geographical society of London on the 22d of June last, on the country and tribes bordering on the Koh-i-Baba Range, Sir Peter Lumsden, the chief of the Afghan boundary commission, on the part of England, said that on the 25th of November last the commission crossed over the Koh-i-Baba Mountains by the Chashma Saby Pass; and in drawing attention to the country, and to the tribes inhabiting the slopes of this range, he proposed to confine himself to the relation of such matter as had not hitherto been brought before the public. Touching, at the outset, on the difficulties presented to the geographer in such a region, he pointed out that to us, happily ignorant of all the horrors involved in the dreaded 'Alaman' or Turcoman raid, a map of a country swept by these raids is difficult to comprehend. In such a district names do not signify towns or villages, but merely the sites where they once existed, marked, perhaps, by mounds delineating the ground-plan of forts, *caravansérais*, houses, or tanks, but of which no other traces now remain. Of the former inhabitants, frequently the only records are the tombstones of their burial-places, from some of which data may be secured in marking the period when they were swept into slavery or destroyed. For instance: in the tract of country between Gulran and the Kushk River, the last inhabitants were Usbeg and Hazara, and on the tombstones of their dead were dates extending as nearly as possible over a century; viz., from A.D. 1650 to 1750. Another difficulty to the geographer is that there are generally two names for each stream or location, — the first, the traditional one, known to Afghan and Persian, and frequently of Arab or Persian origin; the second, that by which it may be known to the Turcoman shepherds or sirdars, who alone traverse these little-frequented routes. Along the northern base of the Koh-i-Baba are a succession of fertile valleys, through which run streams formerly used for irrigation purposes. The marks of water courses point out the lines of ancient channels, while in many places karezes (that is, subterranean canals) indicate a state of past prosperity and extensive cultivation. Towers and walls of still existing forts show, that, even in those far distant days, property required protection; and, as on the site of the old castle of Gulran, the skulls and skeletons scattered over it seem to indicate that indiscriminate slaughter must frequently have attended the destruction of local cities long since untenanted. At Bala Murghab, Karawal Khana, Meruchak, and Penj Deh, besides in several other places, there are foundations marking the existence of former permanent bridges across the Murghab; and extensive re-

GATEWAY OF BALA MURGHAB. (Ill. *London graphic.*)

mains of large towns at Penj Deh, Killa-i-Maur, Meruchak, and Karawal Khana indicate a state of prosperity once existing in these valleys which has long passed away.

Passing from the physical features of the country to describe the character and mode of life of the population, he said there was a marked difference between the Afghans and Turcomans. In Penj Deh, the principal valley of Bagdis, they scarcely ever saw an armed man, and found the Sariks, instead of being the dreaded alaman-sweeping and slave-dealing people they came to see, an industrious, hard-working race, at that time busy from morning to night in the excavation and clearing of their canals, always moving about with a spade having a somewhat triangular-shaped blade continually across their shoulders. The Sariks were stalwart men of good physique, resembling very much in character the Turks. A shrewd, hard-headed, practical people, they continually expressed their desire for security and permanent settlement. These Sariks, along with their brethren of the Tekke, Salor, and other Turcoman tribes, had been for a century the scourge of northern Persia: they had swept the inhabitants away from valley after valley down the Hari-Rud, almost as far as Seistan and westward, within a hundred and fifty miles of Teheran itself. From the slave-trade and plunder secured in these raids they had amassed comparatively great wealth, and they certainly seemed better off than most Asiatic races. The slave-trade and raiding having been entirely abolished, owing to the action of Russia and the closing of the markets, these Turcomans now eagerly seek for a source from which they can secure wealth, and maintain their present prosperity. They own great herds of sheep, amounting in 1884 to an aggregate of 194,250, divided into flocks of from 700 to 1,500 each. They have hitherto generally disposed of their sheep in the Bokhara and Oorgunj markets. On the spot the price of sheep is from 4s. to 8s. 6d., according to age and quality, the latter sum being the price for a four-year-old; camels fetch about £6 10s.; horses, from £13 to £25; bullocks, £2 10s. to £3; cows, £2 to £2 10s.; and goats, from 4s. 6d. to 6s. With regard to the Turcoman horses, the conclusion arrived at by the officers with him, and he believed also by the Russians, was that the Turcoman horse has altogether been overrated, and that in many respects he is inferior to the numerous herds bred in more mountainous tracts, such as the Kuttighanie of Afghan Turkestan. The Turcoman women do a vast amount of work: they fabricate carpets, purdahs for doors, work-bags, horse-clothing, nummads, and blankets; and, when a young woman is engaged, it is thought to be the right thing for her to work all the kibitka domestic carpets and other household requisites before she is married. When, however, they do marry without having completed this task, it is expected from them, that as soon as practicable, by their own labor, they may refund in cash or kind, to their husbands, the dowry paid to parents on marriage. Such dowry generally consists of 100 sheep and 40 tillas, which the bridegroom either pays down in a lump sum to the parents of the bride or by stipulated instalments. The trade of Penj Deh is carried on entirely by Jews, of which there are some twenty families settled here: they are offshoots from the Jewish colony at Herat. They number something like three hundred and fifty families, and have in their hands most of the trade with Balkh, Bokhara, Khiva, and Merv.

Jamshedi. Hazara. Sarik Turcoman.

SOME TYPES OF AFGHAN TRIBES. (Ill. *London graphic.*)

After quoting copious extracts from Capt. Maitland's description of the hitherto little-known tract lying between the Murghab and Hari-Rud Rivers along the Gumbegli route, as well as Capt. Yate's account of the interesting natural feature of the Nomaksar, or salt lakes of Yar-oilan, he summed up by saying that the country was one capable of great resources. The climate is good; the winter is cold; and great storms are not unfrequent during the winter months, indeed the commission experienced one as late as the 2d of April; the spring and autumn, however, are beautiful; and the summer, though hot, is nothing to the extremes of heat to which one is accustomed in the plains of India. It is possible even to live in tents, or kibitkas; and, under the shelter of a roof, such luxuries as punkahs would be superfluous.

With a settled government and increased population, there is no reason why this should not become one of the most prosperous tracts of central Asia.

GEOGRAPHICAL NOTES.

THE fifth expedition of the Belgian international African association, which started with the view of connecting by a chain of stations the east coast with the interior basin, has returned, the expense proving too great to render the project profitable. The Zanzibar agent of the society has returned to Europe. The efforts of the association at present will probably be confined to the Kongo watershed.

The death of Mirambo, the noted chief of Unyamuezi, is confirmed. His principal rival, Kapira, is also dead. The power of the former was so great an element in securing peace and security of travel, that his death seems a public misfortune. The son of M'tesa is reported to have succeeded his father. He is young and intelligent, and favorably disposed toward Europeans. He was for several years a pupil of Father Levinhac, recently consecrated bishop of Uganda.

Lieut. Hovgaard intends to visit the east coast of Greenland next year at the expense of the Danish government. Herr August Gamel, the owner of the steamer Dimfna, has placed it at his disposal. The majority of copies of the work known as 'Meddelser om Grönland,' published by the Danish government, and which received one of the annual medals of the Paris société de géographie, were burned in the recent conflagration at the palace of Christianborg in Copenhagen.

Caspari has reported on the station of Sheik Said at Cape Bab-el-Mandeb, claimed by France. It appears to be a desert spot, with an exposed roadstead, severe heats, no vegetation, and the fresh water scarce and bad. There is a shallow lagoon containing many fish, out of which a small community of Arabs manage to gain a living. Altogether it would seem a most unpromising spot for a European colony.

La société des études historiques, Paris, offers a prize of one thousand francs, or a medal of equal value, to the author of the best memoir on the following subject: "A study of the consequences, from the point of view of political economy, of the new relations between Europe and West America, eastern Asia and Polynesia, which would follow the completion of the Panama canal." For conditions, competitors should address M. L. Racine, administrator of the society, 62 boulevard de Courcelles.

Assan Khan Saniéduleh, minister to the shah of Persia, has sent to the Paris geographical society a memoir on the district and town of Maybaud, another on the region of Kelat-i-Nadiri, with a map, and the first volume of a series of three, to be devoted to Khorassan, all in the Persian language.

A steamer called the Industrie, of 513 tons, has arrived at Cologne, March 18, being the first vessel to enter that port direct from an ocean voyage. It is expected that she will prove the forerunner of an important commerce.

The missionaries of Uzigay in the equatorial lake region of Africa report that the use of a sort of beer made of bananas has been used by them with excellent results as a prophylactic against malarial fevers. Owing, as they suppose, to its use, they have enjoyed in that pestilent region the best of health. The matter seems worthy of investigation.

Teisserenc de Bort writes, that, midway between Khurd-Rumed and Beresof, his party had discovered a depression called by the inhabitants Sebkha Zeita, six or eight kilometres in extent, which forms a lake during the wet season. It is surrounded by an almost circular chain of dunes, between which and the lake are found very numerous chipped flints and other vestiges of man, including hundreds of hearths where the stones show traces of fire.

ASTRONOMICAL PROGRESS IN 1884.

PROFESSOR NEWCOMB contributes to vol. ix. of Appletons' annual cyclopaedia, just published, an interesting article on 'Astronomical phenomena and progress during the year 1884.' In observatories and instruments, he notes the completion of the Lick observatory, with the exception of its equatorial; and the mounting of the great telescopes at the University of Virginia and at Pulkowa, the latter of thirty inches aperture, the largest refractor yet made. In solar physics, Langley's Mount-Whitney work receives first attention, and the tardy appearance of the sun-spot maximum in 1884 (one or perhaps two years behindtime) is remarked. From recent determinations of the velocity of light, the solar parallax is found to be 8.794″, and the corresponding distance of the sun, in round numbers, 93,000,000 miles, "which is not likely to be altered by much more than 100,000 miles by any future discoveries."

Recent observations on Jupiter appear to show that the period of rotation at its equator is more than five minutes less than in the latitude of the great red spot, — a result which is of great interest, as tending to confirm the suspected resemblance of that planet to our sun. Saturn, during the winters of 1884, 1885, and 1886, is in an unusually favorable situation for observation; and we may expect valuable testimony on the disputed variability of the rings, and on the many interesting physical phenomena which the planet presents. The asteroids and comets of the year receive due notice. Attention is called to Professor Pickering's inventions in photometry, which have provided us with a standard catalogue of the magnitudes of over four thousand stars, — 'Harvard photometry.' By a very elaborate calculation, Professor Oppolzer has investigated the question whether the excess of the moon's apparent acceleration above its computed value may not arise from the mass of the earth being gradually increased by the falling of meteors upon its surface. He concludes that a precipitation of cosmic dust of about

one-thousandth of an inch in a year would account for the difference. In stellar parallax we find the important work of Gill and Elkin at the Cape of Good Hope, and the surprising results of the Pulkowa observations, which, if confirmed, will place the star Aldebaran among the three or four nearest of the fixed stars. Professor Newcomb mentions the spectroscopic investigations of the motions of stars in the line of sight, observations of the companion of Sirius, cataloguing stars by photography, and the red sunsets, and concludes with a review of the conclusions of the International meridian conference, and a notice in regard to the communication of astronomical discoveries, and the recently founded Watson and Draper astronomical prizes.

WATER-SUPPLY FOR NEW YORK.

MR. J. T. FANNING, who is well and favorably known to the profession by his valuable treatise on water-supply engineering, prefaces a study of the present and future water-supply of New York [1] by a couple of pages, giving a brief historical summary of the establishment of the Croton aqueduct, which at its opening in 1842 supplied the city, then having a population of less than one-third of a million, with an average of twelve million gallons of water daily. The history of the rapid increase in the consumption of water, next given, shows that by 1875 the demand for water had reached the limiting capacity of the aqueduct, which amounted to a daily average of ninety-five million gallons. Since 1875 "the public fountains have ceased, one after another, to flow. Drinking-fountains for either man or beast have been almost unknown of late in the public streets. Meters have been applied in charitable institutions, as well as in manufacturing establishments, and the most stringent measures taken to prevent waste, and at times most urgent appeals made to save the consumption, that the evils of an approaching water famine might be lessened." The New-York water department estimates that the works now in progress will draw from the Croton watershed a daily average of two hundred and fifty million gallons (see *Science*, No. 124).

On the basis of numerous statistical tables given in the report, as to increase of population and of water-consumption, the attempt is made to estimate the period during which these new works will provide a sufficient supply for the city, and for the population which must draw its water from the city supply.

In making this estimate, the needs of the city are taken to include a sufficient supply for the ordinary uses to which water is applied in our larger cities, not excluding those uses in manufacturing establishments for the lack of which business must be curtailed, or settle elsewhere.

The conclusion reached in this report is, that, before the year 1898, the regular increase of population and the expansion of business will require the whole of the projected average supply of two hundred and fifty million gallons *per diem*, and that before 1930 four times that amount may be needed.

Having thus determined that the total available supply from the Croton watershed cannot in any event answer probable legitimate demands for much more than a single decade, the author, in looking to other gathering-grounds from which to draw a sufficient supply for future needs, regards the head waters of the Hudson River in the Adirondack region as the most available source, provided the city is to be supplied by gravitation with water of unexceptionable quality, in adequate quantities, and at a pressure due to a head of two hundred feet or more above tide water, such as will carry water to the upper floors throughout the city.

Careful surveys show that a canal sixty feet wide, thirteen feet deep, and somewhat over two hundred miles long, would carry five hundred million gallons of water *per diem* from near Fort Edward to New York. The estimated cost of this conduit is nearly thirty million dollars; and the auxiliary structures, storage-basins, necessary tunnelling, etc., twenty-five million dollars: total, fifty-five million dollars. It is proposed that the canal run on the highlands east of the Hudson River at an initial elevation of three hundred and fifty feet above tide water, and that this source be also used as the water-supply for the cities and towns on both sides of the river, between Albany and New York, having, according to the census of 1880, an aggregate population of quarter of a million souls, besides the million and three-quarters in New York and Brooklyn. Detailed surveys and the statistics of annual rainfall show that the Adirondack watershed is capable of furnishing an average of nearly fourteen hundred million gallons daily without trespassing upon the river-supply available for canal and manufacturing interests.

This grand and beneficent project must evidently, before many years, be put in process of actual construction. It is greatly to be desired that the state of New York should, as soon as may be, put a stop to the destruction of the Adirondack forests, and reserve a principal part of that region for a park, thus preserving this region as a sanitarium for the commonwealth, as well as the source of a beautiful supply of good healthful water for the entire Hudson valley.

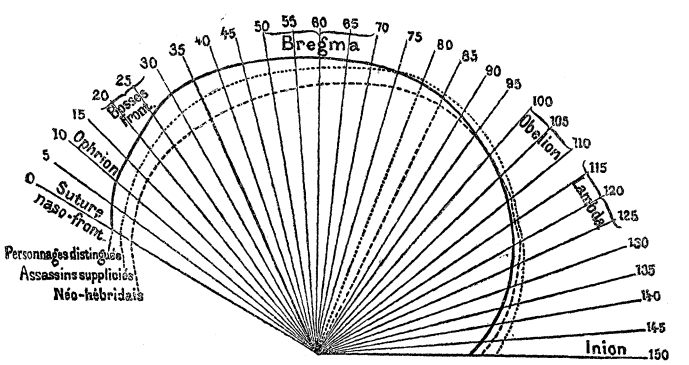
[1] *Report No. 2, on a water-supply for New York and other cities of the Hudson valley.* By J. T. FANNING, C.E. New York, 1884. 36 p., 3 maps. 8°.

COMPARISON OF THE SKULLS OF ASSASSINS AND MEN OF NOTE.

THE material for Dr. N. Bajenoff's studies of the heads of assassins and distinguished persons (*Bull. soc. anthrop. de Paris*) was of two kinds, — first, fifty-five heads of assassins; second, nineteen heads of distinguished persons. This last series seeming too small, he prepared another, composed of the heads of twenty-five noted living men. His main studies were carried on by means of the cephalometer of Anthelme,

which is the only instrument that permits the drawing of a curve from a series of heads by taking for each ray the mean in the series. The mean curve for each series shows that all the frontal rays of distinguished men are much greater than in the assassin, and that in a savage race, the Neo-hebrides, taken for comparison from four heads, the frontal development is even less than among assassins.

These last two curves cross the first in the parietal part, in the neighborhood of the bregma; and the posterior development of assassin and savages is greater in all points than that of distinguished men. In all the distinguished men the occipital rays were less developed than in the other series, though this difference is less marked. The maximum rays, represented in the diagram by dotted lines, are in distinguished



AVERAGE MEASUREMENTS OF THREE CLASSES OF HEADS.

men at the 35° line, while in the other two classes it is found at the back of the head, between the 80° and 85° ray. This rule is not so infallible that we can pick out men, and say this is a distinguished man, this an ordinary man, and this a criminal, simply by the shape of the head; but it can be said that seventy-five in a hundred learned men have the superior character, while at least ninety-five in a hundred assassins have the inferior character. A third part of Dr. Bajenoff's work deals with the cranial projection (total, posterior, anterior, and facial) and the facial angle. These confirm his first experiments. Among distinguished persons the anterior cranial portions are the best developed, while among savages and assassins the facial and posterior projections exceed the others.

ORIGIN OF THE CEREALS.[1]

RECENT numbers of *Naturen* contain interesting papers, by Professor Schübeler, on the original habitat of some of the cereals, and the subsequent cultivation in the Scandinavian lands and Iceland of barley and rye more especially. It would appear that barley was cultivated before other cereals in Scandinavia; and that the generic term 'corn' was applied among Northmen to this grain only from the oldest times; and that in the Norwegian laws of the seventeenth and eighteenth centuries, wherever reference was made to the '*Kornskat*' (or standard by which land in the northern lands was, and still is, rated in accordance with the corn it is capable of yielding), the term was understood to apply to barley. Proof of the high latitude to which the cultivation was carried in early ages is afforded by the Egil's Saga, where mention is made of a barn in Helgeland (65° north latitude) used for the storing of corn, and which was so large that tables could be spread within it for the entertainment of eight hundred guests. In Iceland barley was cultivated from the time of its colonization, in 870, till the middle of the fourteenth century, or, according to Jón Storrason, as lately as 1400. From that period down to our own times, barley has not been grown in Iceland with any systematic attention, the islanders being dependent on the home country for their supplies of corn. In the last century, however, various attempts were made, both by the Danish government and private individuals, to obtain home-grown corn in Iceland; and the success with which these endeavors were attended gives additional importance to the systematic undertaking which has been set on foot by Dr. Schübeler and others, within the last three years, for the introduction into the island of the hardier cereals, vegetables, and fruits. As many as three hundred and eighty-two samples of seeds of ornamental and useful plants, most of which were collected from the neighborhood of Christiania, are now being cultivated at Reykjavik under the special direction of the local government doctor, Herr Schierbeck, who succeeded in 1883 in cutting barley ninety-eight days after the sowing of the seed, which had come from Alten (70° north latitude). And here it may be observed that this seems the polar limit in Norway for any thing like good barley-crops. The seed is generally sown at the end of May, and in favorable seasons it may be cut at the end of August, the growth of the stalk being often two inches and a half in twenty-four hours. North of 60° or 61°, barley cannot be successfully grown in Norway at more than from eighteen hundred to two thousand feet above the sea-level. In Sweden the polar limit is about 68° or 66°; but even there, as in Finland, night frosts prove very destructive to the young barley. In some of the fjeld valleys of Norway, on the other hand, barley may, in favorable seasons, be cut eight or nine weeks after its sowing; and thus two crops may be reaped in one summer. According, even, to a tradition current in Thelemarken, a farm there owes its name, *Triset*, to the *three* crops reaped in the land in one year. Rye early came into use as a bread-stuff in Scandinavia, and in 1490 the Norwegian council of state issued an ordinance making it obligatory on every peasant to lay down a

[1] From *Nature* of June 4.

certain proportion of his land in rye. In Norway the polar limit of summer rye is about 69°, and that of winter rye about 61°; but in Sweden it has been carried along the coast as far north as 65°. The summer rye-crops are generally sown and fit for cutting about the same time as barley, although occasionally in southern Norway less than ninety days are required for their full maturity.

CASSINO'S STANDARD NATURAL HISTORY.

The editors of the 'Standard natural history' have undertaken a most difficult and praiseworthy work. The aim set in the prospectus is to give "a popular account of the whole animal kingdom by the best American authorities," and American forms are to be made especially prominent. Mr. J. S. Kingsley is editor-in-chief, and each type or class is described by some naturalist who has made special investigations in that group. The work is to be completed in six imperial octavo volumes. Of these, two treat of invertebrates, three of vertebrates except man, and the sixth of the human races. Three of them have already been completed.

It is a labor requiring no small study and diligence to collate the immense mass of terribly scattered notes and articles on American zoölogy. But the great danger is, of course, that the work will be too abstruse for popular use, or too popular for scientific accuracy and value. Both these extremes have been uniformly avoided by the different writers with a skill hardly to be expected, and worthy of all praise. There is, too, no such lack of unity or uniformity as one would expect from so large a corps of editors. The figures are remarkably clear and fine. Indeed, the first question that occurs to us is whether some of the luxury in heavy paper, wide margins, and striking full-page cuts, might not well have been dispensed with in order to lower the price of the work, and give it the circulation which it deserves: for to many young students, and teachers in our schools and academies, this work would be the very best help; and yet to them especially the price, six dollars a volume, will be an insuperable obstacle.

The introduction, which occupies seventy pages of the first volume, opens with an account of protoplasm and the cell. In the whole introduction only five pages are devoted to embryonic development. This subject is treated under each group in the systematic portion of the work only in a general and very meagre outline. This is perhaps wise in a popular work, but for that very reason it should have been described in the introduction as fully as is consistent with a purely general outline. Twenty pages are devoted to the nervous system and animal psychology, forming a brief but admirable epitome of what is known of this as yet almost unexplored field. The single page devoted to alternation of generations and parthenogenesis is the least satisfactory in the introduction: the statement is meagre, the line of argument any thing but clear. Evolution is discussed in twelve pages, six of which are devoted to a history of the theory and *résumé* of the contributions of American students. It is certainly one of the most marked defects of the work, that this subject of universal and intense interest should not have been fully presented; all the more, because the age, investigations, and views of the writer fitted him to give us a fair and impartial discussion of the subject.

Of the systematic portion of the first volume, one can but notice the generally high character of the work. It does great credit to its editors. Especial notice should perhaps be given to the interesting discussion of the origin and formation of coral islands. The editor of the chapter on Vermes, the most difficult and least familiar branch, has given too little of the anatomy, and has hardly attempted to show the resemblance and affinities between the different classes. It is certainly a pity that the Brachiopoda, which have so many points of interest, should be dismissed with only three pages. Their enormous abundance in early geologic ages, together with the long battle so hotly waged over their affinities and systematic position, should gain for them more attention, and the more so that this conflict originated through the writings of an American naturalist. Even some of their most important anatomical characteristics are not stated; and of their great geological importance as the predecessors of Mollusca, we have scarcely a hint. But, if the introduction and the description of all the invertebrates except Arthropoda must find place in one volume, we ought, perhaps, to be thankful that some groups are not crowded out altogether. The Tunicata are not described in this volume, and hence will probably appear either before or among the lower invertebrates, — after all, their only proper position at the present stage of investigation. The volume closes with a full and very readable description of Mollusca.

The standard natural history. Edited by J. S. Kingsley. Vol. i. Lower invertebrates; vol. ii. Crustacea and insects; vol. v. Mammals. Boston, *Cassino*, 1884–85. 8°.

The second volume treats of the Arthropoda. The Crustacea, Arachnoidea, and Myriapoda are described by Kingsley, who, however, gives the credit of most of the article on spiders to Emerton's book on that group. Three small orders appear under the Hexapoda, — the Dermatoptera (earwigs), the Pseudoneuroptera, and the Aphaniptera. It is certainly still an open question whether entomologists have not studied differences more than affinities in making orders for the earwigs and the fleas. The lowest orders of insects are described by Packard, the Orthoptera by Riley, the Hemiptera by Uhler, the Coleoptera by Dimmock, the Diptera by Williston, the Aphaniptera by Kingsley, the Lepidoptera by Fernald (moths) and H. Edwards (butterflies), and the Hymenoptera by Howard and Comstock. This volume is almost purely systematic. Here (largely, we may believe, on account of the subdivision of the work and the lack of a complete understanding between the different writers) much important material has been omitted. Either under the general head of Hexapoda or the different orders, a general account of insect anatomy should have been given at length. The whole subject of metamorphosis is treated only in a most bare and meagre outline, and yet there is no topic of which we could rightly expect a more full and careful treatment. Of its necessity or advantage to the type or class, of its probable origin, of the different intermediate grades between the two main types, and of its bearing on the question concerning the ancestral form of insects, we find no notice. Throughout this volume we miss the broad deductions and generalizations which are so interesting and important to the common reader, and which are really the aim and goal of all scientific study.

If, too, the systematic study of insects is deemed the subject of greatest interest to the popular mind, the amateur student would have been greatly aided in determining his collections by tabular classifications of the families and genera. But while the reader will regret some things omitted in this volume, he will not fail to find in each section a description of the most important and interesting forms in each class and order. Each part is a thorough systematic monograph of its class.

The editors of the fifth volume had certain advantages over those of the first and second. The subject was naturally more interesting to the popular mind: it had been much more thoroughly worked by other writers, whose mistakes, at least, they could avoid. They had more space for carrying out their plans. The class possessed a much higher degree of unity, and there were fewer editors. It will not, therefore, seem an invidious comparison if this volume, while perhaps no more accurate than the others, is pronounced the best in the general selection of material, and treatment of the subject. There is a fair amount of anatomy. The relations of the different orders and families are briefly but well noticed. It will be interesting reading for any one, and a valuable reference volume for the working zoölogist. The discussion of the origin and different races of the domesticated animals is in all cases full and good. This volume, of course, cannot treat so purely of American forms as some others, but our American mammals receive their fair share of attention. The systematic arrangement of the different orders, families, and genera, and the general basis of classification, are more sharply emphasized than in any preceding volume.

The point most noticeably worthy of criticism in the volume, and generally throughout the work, is the unnecessary profusion of plates and cuts. If the work were purely anatomical, they would be extremely useful, or even necessary. As it is, they add really only to the attractiveness of the work. The work is really one which all teachers should have, and which every student would find extremely useful; but it is too luxurious for those who need it most. May we not hope that the publisher will some time give us an edition not all too much condensed in the important subject-matter, but with fewer full-page plates, and generally less of the luxury usually so incompatible with the study of the working zoölogist?

MAXIMS OF PUBLIC HEALTH.

THIS book is addressed, not so much to health authorities as to the general reader. Dr. Wight has embodied in it, in a popular style, the results of several years of experience as the health-officer of two large western cities. No attempt is made at a systematic plan; the many subjects pertaining to public hygiene being presented mainly in the form of aphorisms, or detached paragraphs. Legal points with reference to nuisances, contagious diseases, and offensive trades, are introduced; the rights of citizens concerning sanitary matters are clearly and concisely set forth; and important decisions bearing upon them are cited.

Maxims of public health. By O. W. WIGHT, A.M., M.D., health-officer of Detroit. New York, *Appleton*, 1884. 176 p. 12°.

The author's style is entertaining, often witty, and, in his own words, "the intelligent householder who has no time, probably no inclination, for systematic studies, may read herein as he runs, and find hints that will save himself and his loved ones from unspeakable pain and sorrow."

In view of recent results of investigation concerning the comparative value of disinfectants, the author's statement as to the use of vinegar for such purposes, and also as to the value of 'little pinches of sulphur' burned every hour throughout a house in which are patients ill with infectious disease, is misleading. Such a procedure would only prove noxious to the inmates, without accomplishing even the slightest good. It would be far better to wait until convalescence is established, and then vacate the apartments, and proceed with thorough disinfection.

In the words of one of the best authorities on the subject, "There can be no partial disinfection of infectious material. Its infecting power is either destroyed or it is not." The same authority, Dr. Sternberg, also recommends the employment of three pounds of sulphur to every thousand cubic feet of air space, as requisite for thorough disinfection.

The chapters on small-pox, cholera, and other infectious diseases, are valuable, and set forth clearly, and in a salient manner, the importance of preventive measures.

REMSEN'S ORGANIC CHEMISTRY.

IN the preparation of this work, Professor Remsen has performed valuable service for the advancement of chemical science in this country, since it will place within the reach of those who are deprived of access to the best sources of information a systematic exposition of the principles of modern organic chemistry. There has long been felt the need of a text-book in English on organic chemistry that would present in a concise form its fundamental principles according to the most recent knowledge of the subject, without entering so far upon details as to render the book too comprehensive for ordinary use. To those who are familiar with the voluminous literature of this subject, the difficulties to be encountered in the preparation of such a text-book are apparent, and they will doubtless appreciate the judicious selection of material and its systematic arrangement in this volume. The thoroughness with which structural relations of organic compounds are treated will be very serviceable to the student, especially the constitution of the aromatic hydrocarbons, including naphthalene and anthracene, and the methods employed in demonstrating the structure of their derivatives.

Certain peculiarities in the nomenclature adopted, and in the form of some of the structural symbols, will probably not find acceptance with all chemists. Yet, concerning the nomenclature of organic chemistry in general, it cannot be denied that usage is far from uniform, and there is even greater confusion in the terms employed than with inorganic compounds. Chemists do not seem inclined to accept fully the rules proposed by the late Dr. Watts, although it must be admitted in their favor that they possess at least the advantages of a system. In the structural symbols of the unsaturated compounds, including the aromatic series, it is difficult to see what is gained by departing from the usual custom of representing fully the valence of the carbon atoms by bonds. There would be little danger of misconception as regards their true significance after the careful explanations given on pp. 213, 225, and 239; and unquestionably a student gains clearer ideas of the chemical changes in passing from one homologous series to another, by writing the structure formulae in full, with the valence of the atoms concerned.

Numerous errors are noticed, few of which, however, interfere with the scientific accuracy of the work. The assertion that citric acid has not been made artificially is hardly in accordance with fact; and it is not strictly accurate to state, that, in the manufacture of acetic acid from wood, the crude distillate is neutralized with soda-ash, since, in this country at least, the acid is usually converted into the calcium salt. In the artificial preparation of alizarine, it is generally understood that this dye-stuff can be made only from anthrachinonesulphonic acid, anthrachinone-disulphonic acid giving isopurpurine or allied products.

Another important feature of this work is the introduction of occasional experiments designed to familiarize the student with compounds described in the text. This plan could doubtless be extended to excellent advantage; and there would probably be a large demand for another volume of equal size, devoted exclusively to laboratory appointments, manipulation, and experimental work in organic chemistry.

An introduction to the study of the compounds of carbon; or, Organic chemistry. By IRA REMSEN. Boston, *Ginn, Heath, & Co.*, 1885. 10+364 p., illustr. 8°.

BACTERIA.

ANY work with the name of Cornil and Babes upon the titlepage demands attention, and this beautiful and complete presentation of the subject of bacteria as related to disease, particularly. In the preface the authors grant that the subject is in so transitory a state that no work of permanent value can be written upon it. Their book, however, approaches as near as may be to such a standard, and is a complete presentation of the condition of bacteriology to-day. They say, with perfect truth, that bacteriology is now a natural science of sufficient importance and completeness to take its proper place in hygiene, etiology, and pathological anatomy, both in the theoretical discussions and practical applications of these branches of medicine.

With the object in view of presenting all the researches upon the bacteria in their proper light, the authors have produced a profusely illustrated book, containing all that is known in regard to these minute organisms at the present time. The contributions to the literature of the subject are so numerous, and of such varying degrees of worth, that a careful selection had to be made. This selection has been unsparing, and, in the main, judicious; so that the whole field of what has been done which is of interest to medical practitioners and hygienists is well placed before us. The work begins with an introduction to the study of the pathogenic bacteria; and a rapid summary of the beginning and progress of discovery in this direction is given. This is of especial value to the student because of the copious references to original monographs that are made.

The development of the microscope for work of this kind, the discussions as to the specific nature of infectious diseases, and the criticisms which bacteriology has undergone, are reviewed, and this is followed by the first part of the book proper. This part is devoted to a consideration of the Schizomycetes in general. The various forms of the organisms are given and illustrated, and their methods of growth are treated at length. Fermentations are defined as they should be, — as "chemical processes undergone by substances broken up under the influence of organisms without chlorophyl, which develop and live in the liquid which ferments."

A full account of all the instruments and materials necessary for work in the observation of bacteria, with the methods of employment, renders this part of the subject plain, while the discussion of the aniline colors conveys information not easy for the student to obtain elsewhere. The methods of culture are given in full; and Koch receives credit for the very great advances he has made in these methods.

The classifications of Cohn, Van Tieghem, and Rabenhorst are spoken of as the latest and best; and a complete list of all the pathogenic bacteria, with their main characteristics, follows.

That bone of contention, 'the attenuation of virus,' finds a place, and the various organisms with which experiments approaching success have been made are allowed to tell their story.

Then the lesions occurring with the presence of pathogenic bacteria occupy the authors' attention; and the modes of entrance, and disturbances of circulation and nutrition produced by them, are all placed before the reader in the plainest way.

A discussion of the 'experimental maladies' of Koch and others closes the first part of the work, which is followed by a complete bibliography of the important works upon bacteria in general.

The second portion of the book is devoted to the special infectious diseases; and a glance at the way in which the work has been done compels the highest praise. Beginning with chicken-cholera (*choléra des poules*), and ending with leprosy, the results of all the investigations upon any disease suspected to be due to a micro-organism are passed upon in the most impartial manner. This includes not only the diseases of man, but also those of animals concerning which any evidence of their bacterial origin has been offered. Space is wanting in which to give in full all the admirable characteristics of this book. The one criticism that might be made is, that it should be divided into two volumes, which would make it easier to handle. There is an atlas of twenty-seven plates, illustrating the various forms of bacteria, which is a valuable work by itself. Armed with the contents of the volume, any one would be competent to discuss the subject of bacteria in any presence; and a glance at the literature referred to in its pages will convince the most sceptical that there must be 'something in it.' We regret that we cannot discuss the contents more at length, but we can assure our readers who are interested in the subject of bacteriology that

Les bactéries, et leur rôle dans l'anatomie et l'histologie pathologiques des maladies infectieuses. Par A.-V. CORNIL et V. BABES. Paris, *Algan*, 1885. 8+696 p., illustr., 27 pl. 8°.

they will find here stated the present condition of all the questions under this head.

NOTES AND NEWS.

THE daily papers announce that the U. S. commissioner of agriculture has established as a part of Dr. Riley's division a branch of investigation relating to economic ornithology, and has appointed Dr. C. Hart Merriam, a well-known ornithologist, and secretary of the American ornithologists' union, a special agent to take charge of this part of the work. Dr. Merriam will make his headquarters at Sing Sing, N.Y., until Oct. 1, and after that at Washington. The scope of the investigation will cover the entire field of inter-relation of birds and agriculture, particularly from the entomologist's stand-point. The inquiry will relate primarily to the food and habits of birds, but will include also the collection of data bearing on the migration and geographical distribution of North-American species. In this last inquiry the department hopes to have the co-operation of the ornithologists' union, Dr. Merriam being at the head of the union's committee on migration.

— The sixth annual meeting of the Society for the promotion of agricultural science will be held at Ann Arbor on Tuesday, Aug. 25. There will be public sessions in the forenoon and afternoon, and a business meeting in the evening. The entomological and botanical clubs of the association will also hold their meetings on Tuesday.

— The Western society for psychical research was organized at Chicago in May, and held its first meeting on Tuesday evening, June 3, at the Sherman house in that city. The president, Dr. A. Reeves Jackson, delivered an address, which has been published. Committees were appointed on thought-transference; hypnotism, clairvoyance, and somnambulance; apparitions and haunted houses; physical phenomena; and psychopathy, "under which head attention may be given to what is popularly known under the various names of 'mind-cure,' 'faith-cure,' 'metaphysical treatment,' 'magnetic healing,' etc." The officers of the society are, president, Dr. A. Reeves Jackson; vice-presidents, Rev. C. G. Trusdell and Professor Rodney Welch; secretary and treasurer, J. E. Woodhead.

— The section of mechanical science (and engineering) of the American association for the advancement of science promises to have interesting sessions at the Ann-Arbor meeting. The committee on the best method of teaching mechanical engineering — Prof. J. Burkitt Webb, Prof. George J. Alden, Dr. Calvin M. Woodward, and Professor Arthur Beardsley — request all who are interested to make sure of being present at the particular session to be devoted to this subject, and to come prepared to take an active part in the discussion of the same. The committee on the use and value of accurate standards, screws, surfaces, and gauges, and of systematic drawings in the modern machine-shop, — Prof. William A. Rogers, Mr. Oberlin Smith, and Prof. J. Burkitt Webb, — have arranged for a special session upon this subject; and they would urge those who feel its importance to present papers, and join in the discussion.

— In his annual address as president of the Royal geographical society, Lord Aberdare called particular attention to a report (which is soon to be printed), by Mr. Scott Keltie, on the state of geographical education in Great Britain. According to this, it appears that the books are poor, the instruction inadequate, and the encouragement wanting in almost all schools, and particularly in schools of high grade. Geography as a class subject is not recognized by professorship or readership in the universities. On the continent, and especially in Germany, the case is very different. Twelve professorships of geography may be found in the twenty-one universities of Germany, and most of the twelve have been founded within the last twelve years. The ideal aimed at is a continuous course of geographical instruction from the youngest school-year up to the university. Mr. Keltie gives examples of some of the lessons which he heard, indicative of a masterly as well as a practical treatment of the subjects in hand. Lord Aberdare commended heartily this new effort of the geographical society to secure better geographical education. Toward the close of his address, he referred to the past year as full of geographical researches. "Never has the ferment among nations been so wide-spread, or prophetic of such great consequences," he remarked with reference to the operations of the French in Asia and Africa; the Russians in central Asia; the English in Afghan, on more than one border of India, on all sides of Africa, and in Oceanica; the Germans on the African coasts; and the Italians on the Red Sea. These invading hosts, he continues, have had in their trains "naturalists, ethnologists, geologists, — men trained in all the sciences which illustrate geography; . . . knowledge and conquest thus march hand in hand; . . . out of the nettle danger, we pluck the flower knowledge; . . . however much we deplore the violence, we cannot be blind to the scientific results which followed upon the displacement of barbarous people by the civilized."

— It is suggested by the chairman of Section I of the American association for the advancement of science, that a subject, perhaps of principal investigation and discussion at the ensuing meeting, shall be, "The daily ration of the food of working-people in the different sections of the country. 1°. Of what does this ration now consist, and what does it cost? 2°. What proportion does the average cost of food bear to the total cost of living? 3°. What is a true or standard ration, measured by the relative proportions of proteine, fats, and carbohydrates? 4°. What are the kinds of food which contain proteine in largest proportion at the lowest relative cost? 5°. In what manner can a variety of daily rations be made up, each of which shall contain the requisite quantities of nutriment? 6°. Can a schedule of rations at low cost be presented, whereby much of the present waste of

food, or of money expended in its purchase, may be saved? 7°. In what way can information be distributed upon this subject, so as to enable working-people to use true economy in the purchase and in the preparation of food?" The attention of the chairman, Edward Atkinson, has been lately called to the great dearth of the statistics of consumption; and he has been promised the valuable aid of the chiefs of the several bureaus of statistics of labor, and of Prof. W. O. Atwater of Middletown, Conn., in making preparation for this discussion.

— Prof. Robert H. Thurston of Stevens institute, Hoboken, N.J., has accepted the post of professor of mechanical engineering, and director of Sibley college, in Cornell university, Ithaca, N.Y.

— An expedition under the auspices of the Royal geographical society of Vienna was to start in June of this year for the region of the Kongo. Its primary object is to explore the territory lying on the watershed between the Kongo and the Nile, with a view to extending the exact geographical knowledge of that region, and also to studying its natural history and ethnology, and investigating the commercial relations of the new Kongo state. A secondary object will be to obtain news of a former party of explorers, who have been for two years kept confined in the region of the upper Nile on account of the Mahdi affair. On account of the same revolt, the present party will be obliged, instead of taking the usual Nile route, to go to the mouth of the Kongo, and work up that river to the region of the intended explorations. From Stanley Pool two steamers belonging to English parties ply up the river; and the leader of the expedition, Dr. Oscar Lenz, hopes to be able to use one of these to reach a suitable point on the upper Kongo, for the starting-point of his explorations. From this point on, Dr. Lenz has formed no definite plans but will proceed according to the necessities of the occasion, knowing that the territory is as yet completely unexplored, and that every step will add to our geographical knowledge. He hopes to return in about a year and a half; and, indeed, the sum of twenty-five thousand florins, which has been raised for the expedition, will cover the expenses for no longer time than this.

— The French Academy of sciences has awarded the Institute's biennial prize of twenty thousand francs to Dr. Brown Séquard.

— The Japanese have at last, says *Nature*, after much hesitation, promulgated a patent law. As in America, with respect to copyright, it was argued, that, with no patent protection, the Japanese got the benefit of the inventions of the whole world. The new law appears, like many other recent Japanese laws, to be compiled from similar laws of other countries, — a clause from England here, from France there, from Germany in another place, as seemed advisable in the circumstances. The term of protection is fifteen years. "Articles that tend to disturb social tranquillity, or demoralize customs and fashions, or are injurious to health," and medicines, cannot be patented. The inventions must have been publicly applied within two years; and patents will become void when the patented inventions have been imported from abroad, and sold, — an illiberal provision, which prevents the patenting of foreign inventions in Japan, unless the inventor also manufactures them in the country, and which therefore renders the new law practically useless to any but the Japanese inventor. The fees are low, amounting to about three pounds sterling for fifteen years' protection, the one payment down being sufficient; while there are no annuities or annual payments for keeping the protection in force, as in many European countries. The punishments for breaches of the regulations are sufficiently severe to act as a warning against infringement.

— The organizing committee of section A of the British association has arranged for the following discussions at the Aberdeen meeting: 1°, On kinetic theories of gases; and, 2°, On the standards of white light.

— Professor Loomis's twenty-first 'Contribution to meteorology' (*Amer. journ. science*, July) returns to the discussion of the direction and velocity of movement of low-pressure areas, — cyclones, — which had already been treated in several earlier papers. The numerical results now attained agree closely with those already published. The average progressive velocity of cyclonic storms is given as follows: Bay of Bengal and China Sea, 8.4 miles per hour; West Indies, 13.7; Europe, 16.7; middle latitudes of Atlantic Ocean, 18.0; United States, 28.4. When this is combined with the results given in Finley's paper on storm-tracks, we find that our lake region possesses the unhappy pre-eminence of being visited by the most numerous and fastest-moving storm in the world, as far as the world is now known. Taking further account of the strong contrasts of winter temperatures between the Gulf of Mexico and the Hudson-Bay region, which supply the winds in the front and in the rear of the storms, we find sufficient explanation of the frequent and violent changes of weather in our interior states. Professor Loomis examines also the degree of correspondence between the average course of storms and the mean direction of the wind. While the two are not coincident, they are evidently connected, and, as the author points out, the departures of one from the other are probably due to the control exerted on storm-tracks by rainfall, as well as to the fact that the mean direction of the wind is derived from truly superficial observations, while the course of the storm marks the path of a commotion that affects a considerable thickness of atmosphere. It is found that for the mid-Atlantic, near latitude 50° north, the average storm-path corresponds very closely with the average wind direction; but in the western part of the Atlantic the storms turn 30° to the north or left of the wind, while in the eastern part the deviation is changed to 30° to the south or right of the wind. This may find explanation in the effect that the sea between the continents has on the direction of the winds near the shores. The ratio between the mean progress of storms and mean velocity of the

winds for the United States is 28.4 : 9.5, and for the North Atlantic it is 18.0 : 29.8; and this evidently depends largely on the control that land friction exerts on wind velocity.

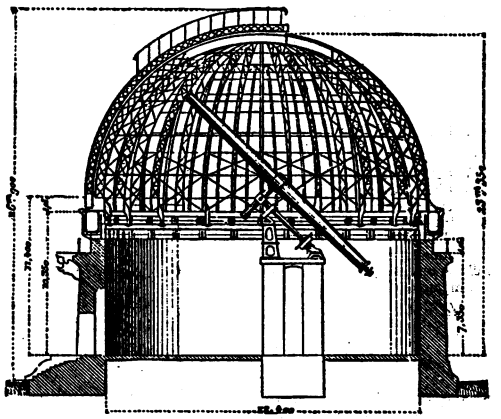


Fig. 1. — Section of floating dome at Nice.

— We learn from *Nature* that the floating dome presented by Bischoffsheim to the observatory at Nice is now finished, and has been recently on exhibition in Paris. It is intended to cover a colossal telescope. It is twenty-two metres in diameter inside, and has a circumference of more than sixty metres, or two metres more than the dome of the Pantheon. Instead of rendering it movable by placing it on rollers, according to the ordinary method, it is closed below by a reservoir for air, which rests on the water in a circular basin (fig. 2). A set of rollers is also placed under the dome to prevent cacillation, and for use when repairs are needed. This system of suspension is said to be so perfect, that, in spite of its great weight, a single person can turn it completely round the horizen. To provide against the water freezing, it has been proposed to dissolve in it a salt to the point of saturation, but it is feared that this may cause corrosion of the apparatus. Frosts, however, are rare in Nice, and special experiments on this subject will be made.

— 'The germ-theory of disease' formed the subject of the 'Alumni lectures' given this year by Dr. W. H. Thomson before the graduates of the Albany medical college.

— We learn from *Nature* that Mr. Burbidge, of the Trinity-college botanical gardens, Dublin, points out that Edelweiss is easily grown in English gardens from seed. It is sown in common garden-earth in a cold-frame, and, when large enough, each little plant is placed in a small pot in a mixture of loamy earth and old lime rubbish; or the plants, Mr. Burbidge says, are equally well pleased by a niche in a sunny rock-garden, provided a supply of their favorite lime rubbish or old mortar be afforded them.

— At the meeting of the Board of visitors of the Royal observatory, Greenwich, the annual report of the astronomer royal was received. In this it is mentioned, that on the publication of Professor Pickering's 'Harvard photometry,' all stars which he had noted as brighter than the sixth magnitude, and which had not been recently observed at Greenwich, were inserted in the working-catalogue, in order that the next Greenwich catalogue might contain all stars, down to the sixth magnitude, which have not been observed at Greenwich since 1860. It is also stated, that, as announced in the *Times* of Jan. 1, the public clock at the observatory entrance, and the other mean solar clocks, were put forward twelve hours so as to show Greenwich civil time, starting at midnight, and reckoning from 0 h. to 24 h., which would correspond with the universal time recommended by the Washington conference. The change from astronomical to civil reckoning has also been made in all the internal work of the observatory, and has been carried out without any difficulty. Greenwich civil time is found to be more convenient, on the whole, for the purposes of this observatory; but its introduction into the printed astronomical observations has been deferred to allow time for a general agreement among astronomers to be arrived at. It is proposed, however, to adopt the civil day without further delay in the printed magnetical results, thus reverting to the practice previous to 1848, and making the time-reckoning harmonize with that used in the meteorological

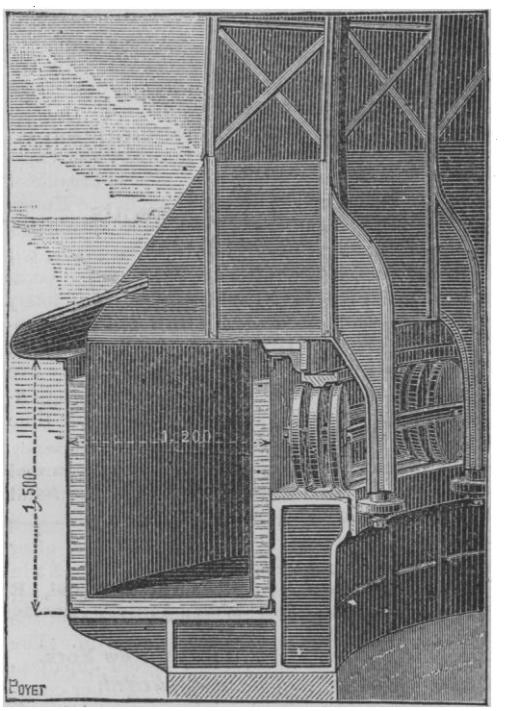


Fig. 2. — Section of float for astronomical dome at Nice.

results, the reckoning from 0 h. to 24 h. being for the future adopted in both cases. This was probably the first step taken after the Washington conference in conformity with its recommendations.